

Citation:

Sahyoun NR, Anderson AL, Tyllavsky FA, Lee JS, Sellmeyer DE, Harris TB. Health, Aging, and Body Composition Study. Dietary glycemic index and glycemic load and the risk of type 2 diabetes in older adults. *Am J Clin Nutr*. 2008 Jan; 87 (1): 126-131.

PubMed ID: [18175745](#)

Study Design:

Prospective Cohort Study

Class:

B - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine whether the dietary glycemic index (GI) and glycemic load (GL) were associated with the risk of type 2 diabetes in older adults.

Inclusion Criteria:

- Recruited into Health ABC study
- Medicare-eligible
- Aged 70-79 years old
- Planned to remain in the same area for three years
- Reported no life-threatening cancers
- Reported no difficulty with basic activities of daily living, walking 1/4 mile or climbing 10 steps.

Exclusion Criteria:

- Use of assistive devices
- Participation in any research studies that involved medications or modification of eating or exercise habits
- Diagnosis of type 2 diabetes before dietary intake was assessed
- Missing information on type 2 diabetes in years three through six
- Men who reported an energy intake of <800kcal per day or >4,000kcal per day
- Women who reported an energy intake of <500kcal per day or >3,500kcal per day
- Missing information on relevant behavioral or sociodemographic factors.

Description of Study Protocol:

Recruitment

Random sample of Medicare-eligible residents of select areas of Pittsburgh PA and Memphis TN.

Design

Prospective cohort

Dietary Intake/Dietary Assessment Methodology

- Dietary intake was measured in year two by trained dietary interviewer using 108-item food-frequency questionnaire (FFQ) based on validated Block questionnaire with modifications to include age-appropriate foods
- Visual aids were used to assist participant reports
- Intakes were determined by using Block Dietary Data Systems.

Blinding Used

Not applicable.

Intervention

Not applicable.

Statistical Analysis

- Characteristics of men and women in the cohort were compared using Student's T-test or Chi-square tests
- Dietary GI and GL were adjusted for total caloric intake by using the residuals method. Participants were grouped by quintile of energy-adjusted dietary GI or GL. Baseline characteristics were examined according to quintile of GI and GL (quintile 1 as reference) using Dunnett's test for continuous variables and chi-square test for categorical variables
- Linear regression or Mantel-Haenszel chi-square were used to assess trends of continuous variables or categorical variables, respectively, in relation to dietary GI and GL
- Multivariate logistic regression was used to assess the risk of type 2 diabetes by quintile of energy-adjusted dietary GI or GL.

Data Collection Summary:

Timing of Measurements

- Behavior, health, social, demographic, and economic information was collected baseline and annually by interview of participants
- Use of exogenous insulin or hypoglycemic medication: Years two, three, five and six
- Fasting glucose: Years two, four and six.

Dependent Variables

Type 2 diabetes: Based on an annual report of physician diagnosis; the reported use of exogenous insulin or hypoglycemic medication; or fasting serum glucose $>126\text{mg/dL}$.

Independent Variables

- Dietary GI: GI values for foods on the FFQ were compiled from the literature. Dietary GI

computed by dividing dietary GL by daily total available carbohydrate intake and multiplying that value by 100

- Dietary GL: GL of a serving of the food was calculated as the amount of available carbohydrate per serving was multiplied by the food's GI value, and that product was divided by 100. Each food's GL was multiplied by the daily frequency of consumption of the food, and these products were summed over all foods.

Control Variables

- Age
- Sex
- Self-identified race
- Education
- Clinical site
- Baseline fasting glucose levels
- Body mass index (BMI)
- Total fiber intake
- Cereal fiber intake
- Alcohol consumption
- Physical activity (evaluated by a standardized questionnaire specifically designed for the Health ABC Study)
- Smoking (lifetime pack-years of cigarette smoking were calculated by multiplying the number of packs of cigarettes smoked per day by the number of years of smoking).

Description of Actual Data Sample:

- *Initial N*: 3,075 (prior to applying exclusion criteria)
- *Attrition (final N)*: 1,898
 - Women N=1,027
 - Men N=871
- *Age*: 70-79 years
- *Ethnicity*: Predominantly white
 - 63.4% of women
 - 71.8% of men
- *Other relevant demographics*: None
- *Anthropometrics*: Differences between dietary and demographic factors were evaluated and found to be different across quintiles of GI and GL. These differences listed in results.
- *Location*:
 - Pittsburgh, PA
 - Memphis, TN.

Summary of Results:

Risk of Type 2 diabetes was not significantly (NS) different by quintile of dietary glycemic index or quintile of dietary glycemic load.

	Q1	Q2	Q3	Q4	Q5	Statistical Significance
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						of Group Difference
Dietary Glycemic Index (mean, SEM)	50.5±0.1	54.3±0.0	56.2±0.0	58.3±0.0	61.8±0.1	
Number of Type 2 Diabetes cases (n)	24	18	15	20	22	
Odds Ratio Type 2 Diabetes (OR, 95% CI)	1.0	0.8 (0.4, 1.7)	0.7 (0.4, 1.5)	0.8 (0.4, 1.6)	1.0 (0.5, 2.0)	P=0.8628
Dietary Glycemic Load (mean, SEM)	94.6±0.9	117.1±0.2	127.3±0.1	138.2±0.2	161.6±0.9	
Number of Type 2 Diabetes cases	17	22	18	20	22	
Odds Ratio Type 2 Diabetes	1.0	1.5 (0.7, 3.0)	1.0 (0.5, 2.2)	1.5 (0.7, 3.2)	1.3 (0.6, 2.7)	P=0.1147

Adjusted for age, sex, race, clinical site, education, physical activity, baseline fasting glucose, BMI, alcohol consumption and smoking status.

Key Findings

Persons in the higher quintiles of dietary GI or GL did not have a significantly greater incidence of type 2 diabetes.

Other Findings

- Subjects in different quintiles of dietary GI were significantly different with respect to most baseline characteristics evaluated ($P < 0.05$). Subjects in the higher quintiles of dietary GI were older; less likely to be female or white, to have a high school degree, or to consume alcohol; and less physically active. They had a higher percentage intake from carbohydrate; a lower percentage intake from protein, total fat and saturated fat; and lower consumption of vegetables and fruit
- Subjects in different quintiles of dietary GL were significantly different with respect to most baseline characteristics evaluated ($P < 0.05$). Subjects with a higher dietary GL also were older; were less likely to be white, to have a high school degree, or to consume alcohol; and had fewer lifetime pack-years of smoking. They also had a higher percentage intake from carbohydrate; lower percentage intakes from protein, total fat and saturated fat; and higher intakes of fruit and fiber.

Author Conclusion:

- The findings of this study do not support a relation between dietary GI or GL and risk of diabetes in older adults
- Because dietary GI and GL show strong nutritional correlates, the overall dietary pattern should be considered.

Reviewer Comments:

- *The authors point out that the narrow range of ages and high-function of the population could skew the findings. In addition, the range for the GI and GL data was relatively narrow and different from was reported in other study populations. The methods by which dietary GI and GL were calculated could potentially skew the results*
- *Overall, it is not clear if these findings would translate to populations that of different age or functional capacity.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

- | | | |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies) | Yes |

Validity Questions

- | | | |
|------|---|-----|
| 1. | Was the research question clearly stated? | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated? | Yes |
| 1.3. | Were the target population and setting specified? | Yes |
| 2. | Was the selection of study subjects/patients free from bias? | Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | Yes |

2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	N/A
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	Were study groups comparable?	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	Was blinding used to prevent introduction of bias?	N/A
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A

5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes

8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes